



NATIONAL LIBRARY OF MEDICINE

Bethesda, Maryland





THE  
NEW METHOD  
OF  
INOCULATING  
FOR THE  
SMALL-POX.

DELIVERED IN A LECTURE IN THE UNIVERSITY  
OF PENNSYLVANIA, ON THE 20th OF  
FEBRUARY, 1781.

BY

BENJAMIN RUSH, M. D.

Professor of the Institutes and of Clinical Medicine in the University  
of Pennsylvania.

THE THIRD EDITION.

PHILADELPHIA:

PRINTED AND SOLD BY *PARRY HALL*, NO. 149, CHESTNUT  
STREET, NEAR FOURTH STREET.

M.DCC,XCII.



THE  
NEW METHOD

OF

Inoculating for the Small-Pox.

---

GENTLEMEN,

IT must afford no small pleasure to a benevolent mind in the midst of a war, which daily makes so much havoc with the human species, to reflect, that the small-pox which once proved equally fatal to thousands, has been checked in its career, and in a great degree subdued by the practice of INOCULATION.

IT is foreign to my purpose to deliver to you the history of this art, and to mark the various steps that have attended its progress to its present state of improvement. We have yet to lament the want of uniformity and of equal success in the practice of it among physicians. A great number  
of

of pamphlets have been written upon the subject without exhausting it. There is still ample room left for the man of genius to exercise his talents for observation and reasoning upon it. The facts I mean to lay before you are so inconsiderable, compared with what still remain to be known upon this subject, that I have to request, when your knowledge in it is compleated, that you would bury my name in silence ; and forget that ever I ventured to lay a single stone in this part of the fabric of science.

IN treating upon this subject, I shall

I. CONSIDER the proper subjects and seasons for inoculation.

II. I SHALL describe the method of communicating the disorder.

III. I SHALL consider the method of preparing the body for the small-pox.

IV. I SHALL mention the treatment proper during the eruptive fever ; and,

V. POINT out a few cautions that are necessary after the disease is over.

I. FOR-

I. FORMERLY there were great difficulties in the choice of the subjects for *Inoculation*. But experience teaches us that it may be practised in every stage of life, and in almost every condition of the human body. In infancy the periods before and after dentition are to be preferred. But we seldom see any great inconveniencies from submitting to the general necessity of inoculating children between the ages of three months and two years. Indeed we often see children cut three or four teeth during the preparation and eruptive fever, without the least addition being made to any of the troublesome symptoms which accompany the small-pox. There is one inconvenience attending the choice of the first months of infancy for inoculating, and that is, the matter often fails of producing the disorder in such young subjects. I have frequently failed in two or three attempts to communicate the disorder to children under four months old with the same matter that has succeeded in a dozen other patients inoculated at the same time. When the inoculation succeeds in such tender subjects, they generally have less fever, and fewer pustules, than are common in any future period of life.

ALTHOUGH a physician would prefer a patient in good health to any other as a subject

ject for inoculation, yet cases often occur in which it is necessary to communicate the small-pox while the body is affected with some other disorder. I can with pleasure inform you, that the small-pox is rendered so perfectly safe by inoculation, that there are few chronic diseases which should be considered as obstacles in the way of it. I have inoculated patients labouring under a tertian fever, obstructed viscera, the whooping cough, the hypochondriasis, the asthma, the itch, and other cutaneous disorders, and even pregnant women, with the same, and in some instances, with greater success than persons in perfect health. Doctor *Cullen* informs us that he has seen inoculation succeed in scrophulous patients. A physician in *Jamaica* informed me that he had inoculated Negroes with success in the worst stage of the yaws. To these facts I must add one more extraordinary than any that has been yet mentioned: Doctor *Brown*, my late colleague in the care of the military hospitals, informed me, that he had seen inoculation succeed in patients who were seized, after the infection was communicated, with the hospital fever. The preparation of the body should be accommodated to the disease which affects it. Some physicians have thought the small-pox, received in this way, was a remedy for other diseases, but my experience has not confirmed

firmed this opinion. On the contrary, I am disposed to think that no other change is produced by inoculation, than by the regimen and medicines that are used to prepare the body for the small-pox. Nor does the small-pox, during its continuance, afford any security against the attacks of other diseases. I have seen the most alarming complication of the small-pox and measles in the same person.

THE seasons commonly preferred for inoculation in this country are, the spring and fall. It may be practised with equal safety in the winter, a due regard being had to the temperature of the air in the preparation of the body.

THE principal objection to inoculating in the summer months in this climate, arises from the frequency of bilious disorders at that season, to which the preparation necessary for the small-pox probably disposes the body. This caution applies more directly to children who at a certain age are more subject than grown people to a disorder in their bowels in warm weather.

II. THE methods of communicating the small-pox by inoculation, have been different in different countries, and in the different æras of its progress towards its present stage

stage of improvement. The scab, doffel of lint, and the thread impregnated with variolous matter and bound up in a gash in the arm, have been laid aside.

WE are indebted to Mr. *Sutton* for the mode of communicating it by a slight puncture with the point of a lancet, or needle, dipt in fresh matter. As it is difficult sometimes to procure matter in a fresh state, I have been led to use it with equal success by preserving it on lint in a box, and moistening it with cold water just before I used it. Matter may be kept in this way for a month without losing its infectious quality, provided it be not exposed to heat or moisture. The former destroys its power of infecting as certainly as the salt of tartar destroys the acidity of vinegar. Moisture, by remaining long upon the matter, probably destroys its virulence by subjecting it to fermentation. The longer matter has been kept in a general way, the longer the distance will be between the time of communicating the disorder and the eruptive fever. It will be proper always to yield to the prejudices of our patients in favour of matter taken from persons who have but few pustules. But I am persuaded from repeated observations, that the disease is no ways influenced by this circumstance. I am satisfied likewise that there is no difference

ence between the effects of the matter, whether it be taken in its watery or purulent state. The puncture should not be larger than is sufficient to draw one drop of blood, but it should always be made by a *sharp* lancet, for the sudden inflammation and suppuration, excited by a dull lancet, sometimes throw off the matter so as to prevent its infecting the body\*. No plaster or bandage should be applied over the puncture. It should be made in the left arm of all subjects. The objections to inoculating in the leg are too obvious to be mentioned. I have heard of the disease being communicated by rubbing the dry skin with the matter. My own observations upon this subject give me reason to suspect the facts that are contained in books relative to this mode of infecting the body. I have bound large pieces of lint dipt in fresh matter for twenty-four hours upon the arm, without producing the disorder. A practitioner of physic in *New-Jersey* informed me that he once gave a considerable quantity of fresh variolous matter in a dose of physic without infecting his patient. I suspect the matter that produces the disease is of the same nature with certain poisons,

B

which

\* I am disposed to believe that the external applications which are used by the Indians for the cure of the bite of poisonous snakes, act only by exciting inflammation and suppuration, which discharge the poison from the wound before it is absorbed. All their external remedies are of a *stimulating* nature.

which require to be brought in contact with a wound or sore in the body before they produce their effects. I deliver this opinion with diffidence. The subject stands in need of more experiments and investigation.

III. I COME now to consider the best method of preparing the body for the small-pox. This must be done, 1st by DIET, and 2dly by MEDICINE. The DIET should consist chiefly of vegetables. I have never seen any inconvenience from the free use of milk as a part of the preparative diet. In some habits, where a morbid acid prevails in the stomach, we may indulge our patients in a little weak flesh broth two or three times a week with safety. Tea, coffee, and even weak chocolate, with biscuit or dry toast, may be used as usual, by persons accustomed to that kind of aliment. Wine and spirits of all kinds should be withheld from our patients during the preparation. The more acescent their drinks are, the better. It is unnecessary that this change in the diet should take place till a day or two before the time of communicating the disorder. The system accommodates to a vegetable and low diet in the course of three weeks or a month, so as to defeat in some measure the advantages we expected from it. The good effects of it  
appear

appear to depend in a great degree upon the *suddenness* with which we oblige our patients to conform to it. For this reason, when we are called upon to inoculate persons who have lived more than three or four weeks upon a low diet, we should always direct them to live a few days upon animal food before we communicate the disorder to them. By these means we may produce all the good effects of the *sudden* change in the diet I have already mentioned. 2. The MEDICINES most commonly used to prepare the body for the small-pox are antimony and mercury. The latter has had the preference, and has been given in large quantities under a notion of its being a specific antidote to the variolous matter. Many objections might be made to this opinion; I shall mention only three.

1. WE often see the disorder in a high degree after the system is fully impregnated with mercury.

2. WE often see the same salutary effects of mercury when given before the disorder is communicated to the body, that we perceive when it is given after inoculation; in which case we are sure the mercury cannot enter into mixture with the variolous matter so as to destroy it.

3. If

3. IF mercury acted specifically in destroying the variolous matter, it would render every other part of the preparation unnecessary, but this we know is not the case, for the neglect or improper use of the vegetable diet or cool regimen is often attended with an extraordinary number, or virulence of the small-pox, even in those cases where mercury is given in the largest quantity.

THE way in which mercury prepares the body for the small-pox, seems to be by promoting the several excretions, particularly that by perspiration, which, by diminishing the quantity of the fluids and weakening the tone of the solids, renders the system less liable to a plentiful eruption of the small-pox. But I object to the use of this medicine for the following reasons :

1. IT effectually deprives us of all the benefits of the cool regimen ; for mercury, we know, always *disposes* the system to take cold.

2. ALL the good effects of mercury may be produced by PURGES, which do not subject the body to the above-mentioned inconvenience.

THE

THE PURGES may be suited to the constitutions, and in some cases, even to the inclinations of our patients. I have seen jalap, rhubarb, senna, manna, aloes, soluble tartar, glauher and epsom salts, and the butternut pill, all given with equal success. The quantity should be sufficient to procure three or four stools every day. A little magnesia should always be mixed with rhubarb and jalap in preparing children. It will be sufficient for the mothers and nurses of infants to conform strictly to the vegetable diet. I have never seen any advantages from giving them even a single dose of physic.

IT is hardly necessary to observe, that the quality, dose, and number of purges are to be determined by the age, sex, and habits of our patients. A constitution enfeebled with a previous disease forbids the use of purges, and requires medicines of a restorative kind. Patients afflicted with cutaneous disorders bear larger and more frequent doses of physic than are indicated in more healthy subjects.

IN adult subjects of a plethoric habit, blood-letting is very useful on the third or fourth day after inoculation. We are not to suppose, that every fat person labours under a plethora. A moderate degree of  
fat

fat is so far from rendering the disease more violent, especially in children, that I think I have generally found such subjects have the small-pox more favourably than others.

MODERATE exercise in the open air should be used during the preparation. But hard labour, and every thing that promotes sweat or fatigue, as also the extremes of heat and cold, should be avoided.

IV. WE come now to consider the treatment of the body during the eruptive fever. On the eighth day after inoculation our patients are *generally* seized with the common symptoms of fever. Sometimes this fever appears on the sixth and seventh day after inoculation. But when it is irregular, it is often delayed till the ninth and tenth days. I have seen many instances of it on the fourteenth, a few on the fifteenth and sixteenth, and *one* case in which it did not come on till the eighteenth day after the infection was communicated to the body\*. The place where the puncture was made with the lancet, or needle, generally serves as an harbinger of the approaching fever.

A flight

\* Since the publication of the first edition of this lecture, I have heard of two cases, in one of which the fever did not come on till the twentieth, and in the other till the twenty-first day after the infection was communicated to the body. In some of these tedious cases, I have seen an inflammation and suppuration on the punctured part of the arm on the eighth day without any fever. Perhaps in these cases the inflammation and suppuration are only cuticular, and that the small-pox is taken from the matter which is formed by them.

A slight inflammation appears about it, and a pock rises up in the centre. But this remark is liable to some objections. I have seen *four* instances in which the fever came on at the expected time, and the disorder went through all its stages with the greatest regularity, and yet there was no sign of an inflammation or pock near the spot where the puncture was made: even the puncture itself became invisible. On the other hand, we sometimes see an inflammation and pock on the arm appear on the eighth and ninth days without any fever accompanying them. Some physicians pretend that this inflammation and solitary pock are sufficient to constitute the disease; but repeated experience has taught me to be very cautious in relying upon these equivocal marks. It is true, I have sometimes seen patients secured against the small-pox both in the natural way and by inoculation where these marks have appeared; but I have as often seen such patients seized afterwards with the small-pox in the natural way, to the great distress of families and mortification of physicians. Upon this account I make it a constant practice to advise a second or third inoculation where a fever and eruption have been wanting. As the absence of these symptoms is probably occasioned by the weakness or age of the variolous matter, or the too high state of preparation of  
the

the body, we should always guard against both, by making the puncture the second time with *fresh* matter, by subjecting our patients to a *less* abstemious diet, and by giving fewer doses of physic. I have heard it remarked, that if a slight redness and a small pimple appeared on the arm on the third day after inoculation, it was a sign the matter had infected the whole constitution. I acknowledge I have often seen a greater degree of redness on the third than on the second day after inoculation, but I have not been able to establish a diagnostic mark from it; for I have seen the disease produced on the usual days where the redness has appeared on the second day, and in some cases where it has not appeared until the cruptive fever.

I AM led here unwillingly to discuss the old question, Is it possible to have the small-pox in the natural way after inoculation?—In many of the cases supposed to be the small-pox from inoculation, it is probable the matter has been taken from the chicken-pox, which resembles the small-pox in many of its peculiarities, but in none more than that of leaving pits or marks on the skin. But there are certainly cases where there are the most irrefragible proofs of the infection implanted by inoculation being of a variolous nature, where the disorder

order has been afterwards taken in the natural way. In these cases I would suppose the variolous matter produced only a topical or cuticular disorder. We see something analogous to this in nurses who attend patients in the small-pox. But further, this topical or cuticular infection may be produced by art in persons who have had the small-pox in the natural way. Some years ago I made a puncture on my left hand with a lancet moistened with variolous matter. On the eighth day an inflammation appeared on the place, accompanied with an efflorescence in the neighbourhood of it, which extended about two inches in every direction from the spot where the puncture was made. On the eleventh day I was surprised to find two pocks (if I may venture to call them such) the one on the outside of the fourth finger of my left hand, and the other on my forehead. They remained there for several days, but without filling with matter, and then dropped off rather in the form of a soft wart than of a common scab. Doctor *Way*, of *Wilmington*, repeated the same experiment upon himself, but with an issue to his curiosity more extraordinary than that I have just now related. On the eighth day after he had made a puncture on his hand, a pock appeared on the spot, which in the usual time filled with matter, from which he inoculated several

c

children,

children, who sickened at the usual time, and went through all the common stages and symptoms of the small-pox. It would seem from these facts, that it is necessary the small-pox should produce some impression upon the *whole* system, in order to render it ever afterwards incapable of receiving an impression of a similar nature. A fever and an eruption therefore seem necessary for this purpose. As the inflammation of the arm on the eighth day is a sign of the *topical* and cuticular infection; so an eruption (though ever so small) seems to be the only certain sign of the infection of the *whole* system. The eruption is the more decisive in its report in proportion as it comes out and goes off in the usual manner of the small-pox in the natural way. In those cases where patients have been secured against a second attack of the disorder, where there have been no *obvious* fever or *visible* eruption, I think I have observed an unusual inflammation, and a copious and long continued discharge of matter from the arm. Perhaps this may serve as an outlet of the matter, which in other cases produces the fever and eruption. I am the more disposed to embrace this opinion from the testimony which several authors have left us of the effects of ulcers in securing the body from the infection of the plague. The effects of issues are still more to our purpose.

purpose. We observe a plentiful discharge of matter from them every time the body is exposed to cold, and the febrile effects of it upon the system are thereby frequently obviated. How far a ratio exists between the degrees of inflammation and the discharge of matter from the arm, and the degrees of fever and eruption, must be determined by future and very accurate observations. If it should appear that there are the least inflammation and smallest discharge, where there have been the highest fever and most copious eruption; and on the contrary, if it should appear that there are the greatest inflammation and discharge where there have been the least fever and smallest eruption, I must beg leave to add, without attempting in this place to explain the reasons of it, that the remark, if generally true, is liable to some exceptions. But the subject is involved in darkness; I shall be satisfied if I have brought you within sight of the promised land. Your own ingenuity, like another Jewish leader, must conduct you thither.

THE indications in the treatment of the body during the eruptive fever are,

1st. To regulate the degree of fever.

2d. To

2d. To mitigate troublesome and alarming symptoms.

THE fever which produces the eruption is generally of the inflammatory kind. It sometimes therefore comes on with the symptoms of great heat, preceded with chilliness, and determination to the head and breast, and a full hard pulse. The remedies proper in this case are,

A. BLOOD-LETTING. The quantity to be drawn must be regulated by the violence of the symptoms, the constitution, habits, and even country of the patient, and by the season of the year. I have never found more than one bleeding, to the quantity of twelve or fourteen ounces, necessary in any stage or degree of the eruptive fever of the small-pox by inoculation.

B. COOL air is of the utmost consequence in the eruptive fever. The use of this remedy in fevers marks an æra, not only in the management of the small-pox, but in medicine. The degrees of cold should always be increased in proportion to the violence of the fever. Stove-rooms, so common in this country, should be carefully avoided. The more we oblige our patients to set up and walk in the open air, the better.

ter. Even in those cases where they languish most for the bed, they should be encouraged rather to lie upon, than *under* the bed-clothes. Children should be stript of flannel petticoats that come in contact with their skins; and even clouts should be laid aside if possible, without great inconvenience, and at any rate they should be often removed. Great and obvious as the advantages of cold air appear to be in the eruptive fever, it has sometimes been used to an excess that has done mischief. There are few cases where a degree of cold below forty of *Fahrenheit's* thermometer is necessary in this stage of the small-pox. When it has been used below this, or where patients have been exposed to a damp atmosphere some degrees above it, I have heard of inflammations of an alarming nature being produced in the throat and breast.

C. THE bowels, more especially of children, should be kept open with gentle laxatives. And

D. COOL subacid drinks should be used plentifully until the eruption is completed.

SOMETIMES the small-pox comes on with a fever the reverse of that which we have described. The heat is inconsiderable, the pulse is weak, and scarcely quicker

er than ordinary, and the patient complains of but slight pains in the back and head. Here the treatment should be widely different from that which has been mentioned when the fever is of the inflammatory kind. Bleeding in this case is hurtful, and even cool air must be admitted with caution. The business of the physician in this case is to excite a gentle action in the sanguiferous system, in order to produce the degree of fever which is necessary to the eruption of the pock. For this purpose he may recommend the use of warm drinks, and even of a warm bed, with advantage. If the eruption delays beyond the third day, with all the circumstances of debility that have been mentioned, I have frequently ordered my patients to eat a few ounces of animal food, and to drink a glass or two of wine, with the most desirable success. The effects of this indulgence are most obvious where the weakness of the fever and the delay of the eruption in children, have made it necessary to allow it to mothers and nurses.

THE small-pox by inoculation so seldom comes on with the symptoms of a putrid fever, that little need be said of the treatment proper in such cases. I shall only observe, that the cold regimen in the highest degree, promises more success in these cases

cases than in any others. I have repeatedly been told, that when the small-pox appears confluent among the Africans, it is a common practice, for mothers to rub their children all over with pepper, and plunge them immediately afterwards into a spring of cold water. This, they say, destroys a great part of the pock, and disposes the remainder to a kindly suppuration. From the success that has attended the use of the cold bath in putrid fevers in some parts \* of Europe, mentioned in a former lecture, I am disposed to believe in the efficacy of the African remedy.

THE fever generally lasts three days, and the eruption continues for a similar length of time, counting the last day of the fever as the first day of the eruption. But this remark is liable to many exceptions. We sometimes observe the eruption to begin on the first, and often on the second day of the fever; and we sometimes meet with cases in which a second eruption comes on after the fever has abated for several days, and the first eruption considerably advanced in its progress towards a complete

\* In a dissertation entitled "*Epidemia verna quæ Wratisslaviam, Anno 1737 afflixit*," published in the appendix to the *Acta Nat. Curios.* Vol. X. it appears, that washing the body all over with cold water in putrid fevers, attended with great debility, was attended with success at *Breslaw* in *Silesia*. The practice has since been adopted, we are told, by several of the neighbouring countries. CULLEN'S FIRST LINES OF THE PRACTICE OF PHYSIC.

plete suppuration. This is often occasioned by the application of excessive cold or heat to the body, or by a sudden and premature use of stimulating drinks or animal food.

It COME NOW to treat of the best method of mitigating troublesome and alarming symptoms.

THE only *alarming* symptom is convulsions, to which children are subject during the time of dentition. These have been less frequent, since the liberal and judicious use of cool air in the eruptive fever than formerly. They are often relieved by putting the feet in warm water. But a more effectual and speedy method of curing them, is to expose our patients suddenly to the open air! The colder the air the quicker relief it affords in these cases. To prevent the return of the fits, as well as to allay any disagreeable and troublesome startings; a few drops of laudanum should be given. They generally yield in a little while to this excellent remedy.

THE next symptom which demands the aid of our art, is the inflammation and sore on the arm. Poultices of all kinds should be laid aside; as tending to increase the inflammation

inflammation and sore. Instead of these, the part affected should be washed three or four times a day with cold water\*. This application is not only agreeable to our patients, but soon checks the progress of the inflammation, and disposes the sore to heal about the time the eruption is completed. The eyes should likewise be washed frequently with cold water, to secure them from pustules and inflammation. With respect to those alarming or troublesome symptoms which occur in those cases where the pocks are numerous, or confluent, they happen so seldom in inoculation, that they do not come properly under our notice in this place. They are moreover fully discussed by Doctors *Boerhaave*, *Huxham*, *Hillary*, and other practical writers.

V. I COME now, in the last place, to deliver a few directions that are necessary after the eruption and suppuration are over.

IT is well known that eruptions of an obstinate nature sometimes follow the small-pox. These I believe are often occasioned by a too *sudden* and speedy use of animal food. To guard against these disagreeable consequences of inoculation, it is of the ut-

D

most

\* Where the inflammation on the arm has been so considerable as not to yield immediately to the application of cold water, I have used the vegetable-mineral water with advantage.

most importance to enjoin a cautious and *gradual* return to the free use of an animal diet ; and at the same time it will be necessary to give our patients a dose or two of purging physic.

— Thus, Gentlemen, have I delivered to you a short history of the new method of inoculating for the small-pox. I am aware that prejudices are entertained against some parts of it by physicians of the most ancient name and character among us. I have witnessed the effects of the old and new methods of preparing the body upon many thousand patients, and I am satisfied not only from my own observations, but from the experience of gentlemen upon whose judgments I rely more than upon my own, that the new method is by far the safest and most successful. Added to this, I can assure my pupils, that I have never known a single instance of a patient, prepared and treated in the manner I have described, that ever had an abscess after the small-pox, or even such an inflammation or sore upon the arm as required the application of a poultice.

THE END.

A  
T R E A T I S E  
O N  
The Venereal Disease.

B Y  
J O H N H U N T E R.

W I T H P L A T E S.

Is now Published and for Sale by PARRY  
HALL, No. 149, Chestnut Street.

*(Price, neatly bound and lettered and rolled edges,  
Two Dollars and a Half.)*

---

Also,  
D R . R U S H ' s  
M E D I C A L I N Q U I R I E S  
A N D  
O B S E R V A T I O N S .

*(Price, neatly bound and lettered, Eight Shillings  
and Four-pence.)*



Med Hist  
WZ  
270  
R 95210  
1792  
C.1

